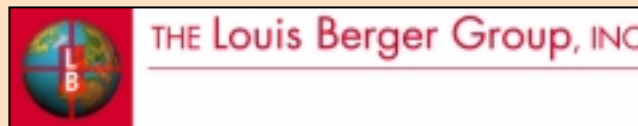


Roses Creek Benthic TMDL Development

Brunswick, Virginia

**Public Meeting #1
November 20, 2003**



Objectives

- To explain the TMDLs: What is? Why? Which segment? How?
- To present and review the steps and the data used in the development of the **Benthic Impairment** TMDL for the listed segment of Roses Creek.

Water Quality Standard Benthic

- The General Water Quality Standard:
“All state waters shall be free from substances [...] which are harmful to human, animal, plant or aquatic life.” (9 VAC 25-260-20).
- Support of the aquatic life use is determined, in part, based on the biological assessment of the benthic community (= visible critters that live on the stream bed).

Roses Creek Benthic Impairment

- Based on Biological Assessment of Benthic Community
 - Some assessments have indicated the benthic community was impaired in the past.
 - For these cases, the segment only partially met the Aquatic Life Use support goal.

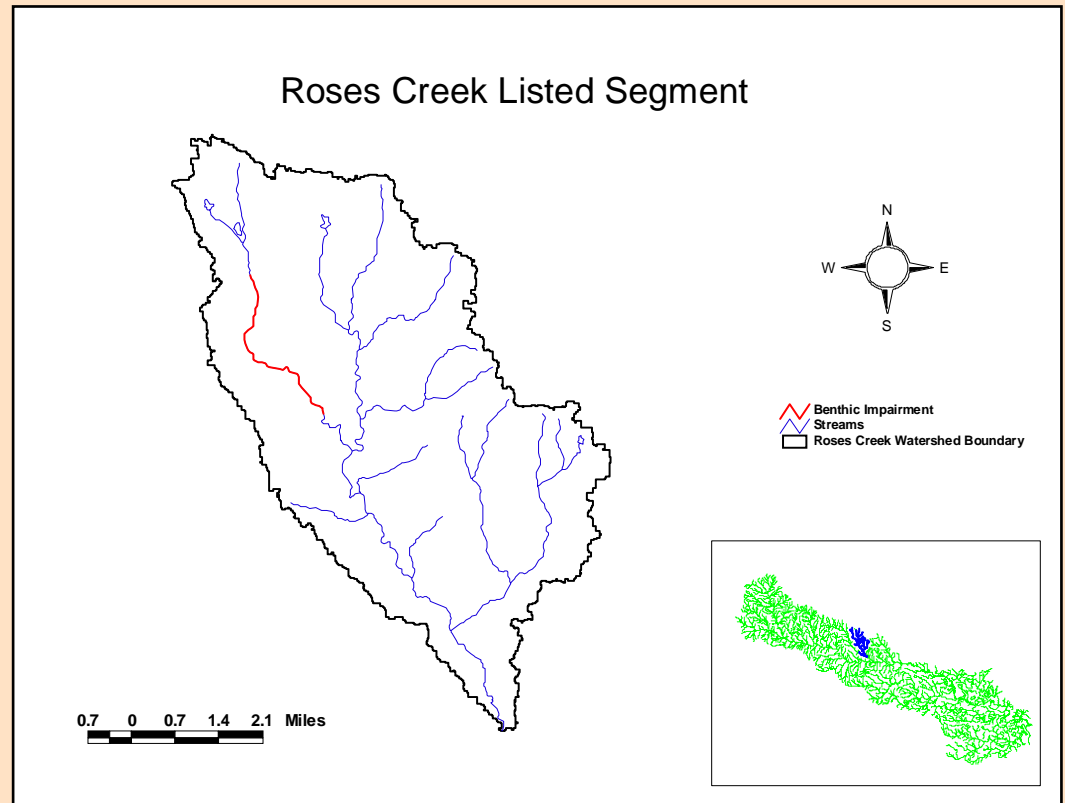
Biological Assessment Ratings

Year	Season	Impairment Rating
		5ARSE006.68
1990	Fall	Moderate
1991	Spring	Non-Impaired
1991	Fall	Non-Impaired
1992	Spring	Non-Impaired
1992	Fall	Non-Impaired
1993	Spring	Non-Impaired
1993	Fall	Slight
1994	Spring	Slight
1996	Spring	Non-Impaired
1996	Fall	Non-Impaired
1997	Spring	Non-Impaired
1997	Fall	Non-Impaired
1998	Spring	Non-Impaired
1998	Fall	Moderate
2002	Spring	Non-Impaired
2002	Fall	Non-Impaired

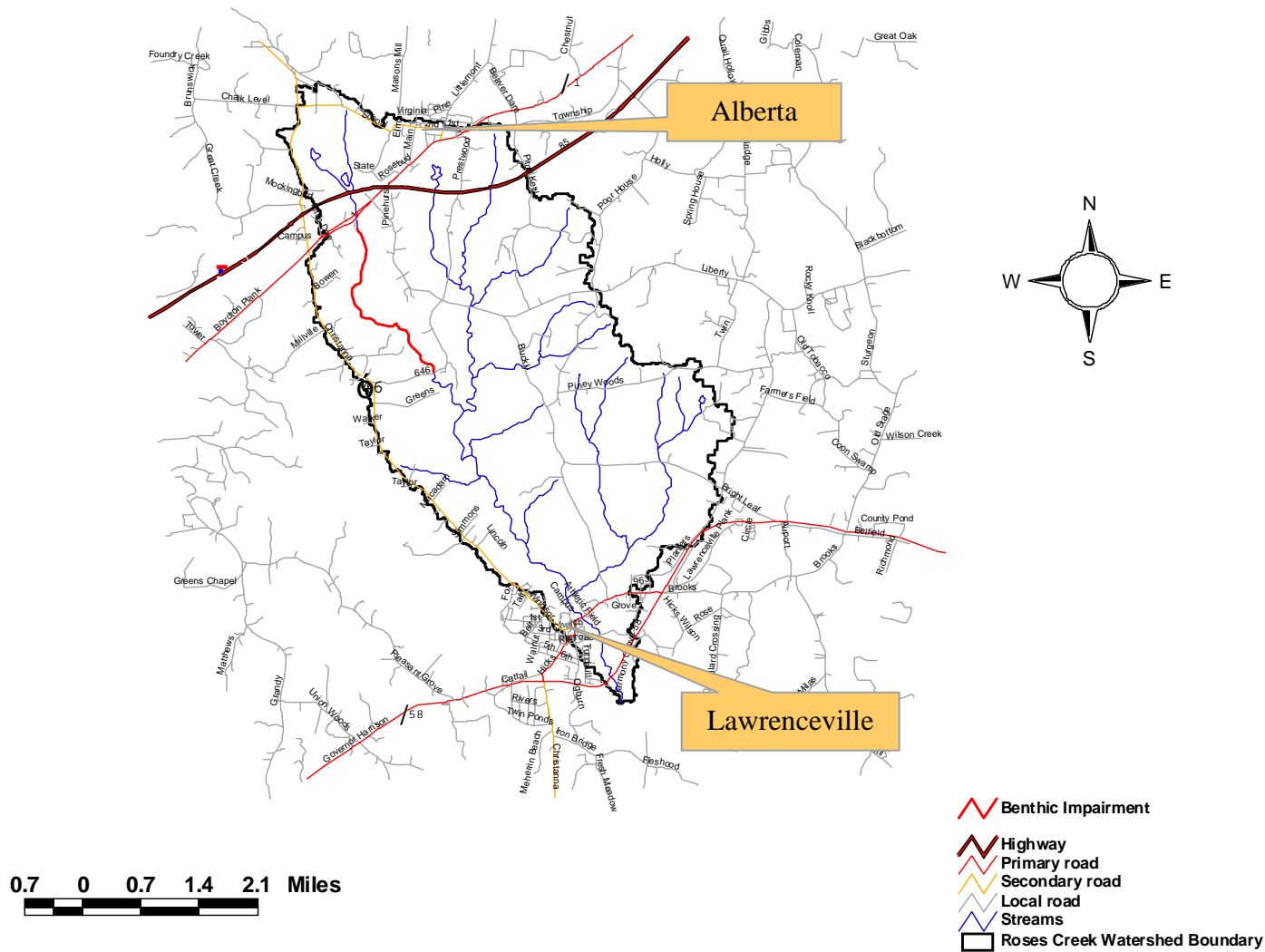
Roses Creek Listed Segment

Based on the 2002 303(d) List:

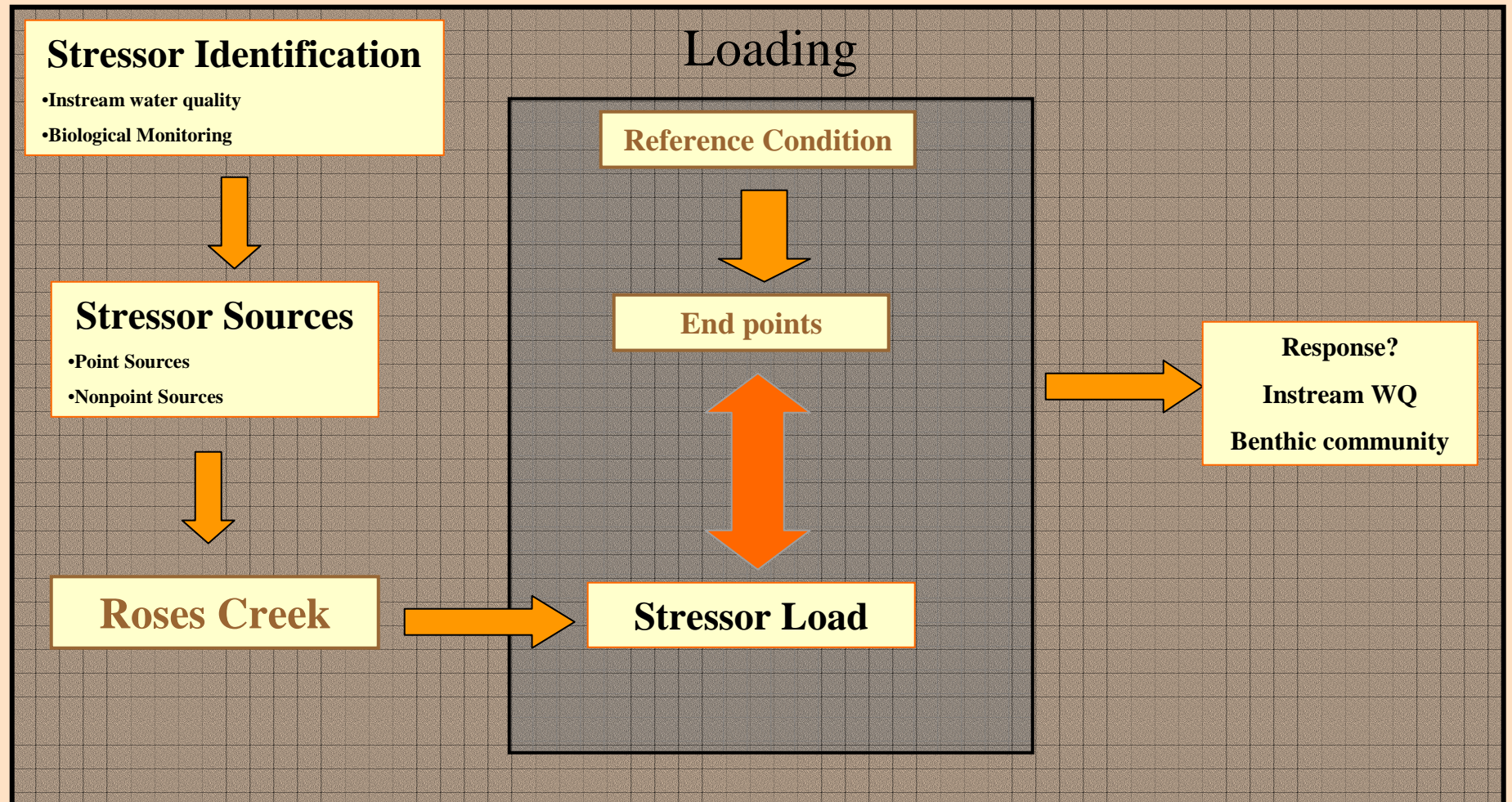
- **Upstream Limit:**
 - Town of Alberta STP Discharge
 - River Mile: 9.83
- **Downstream Limit:**
 - Route 646 Bridge
 - River Mile: 6.68
- **Impairment Cause:**
 - 303(d) list indicates the impairment was due to logging operations and the Alberta STP discharge.



Roses Creek Watershed



TMDL Process for Benthic Impairment



TMDL Development Process

1. Define the problem
2. Identify the cause (stressor) of impairment
3. Define the numeric targets (in absence of state defined numeric criteria a reference watershed approach is used: a non-impaired watershed with similar characteristics)
4. Identify and characterize all sources
5. Estimate loadings under the existing conditions
6. Evaluate the linkage between the stressor loadings and instream response
7. Develop allocation scenarios (for each stressor) necessary to restore Benthic community
8. Develop a follow up monitoring plan
9. Develop an implementation plan

Stressor Identification

- What pollutant(s) is causing the impairment of the benthic community?
- Common stressors include:
 - Organic Matter
 - Nutrients
 - pH
 - Temperature
 - Sediment
 - Toxics

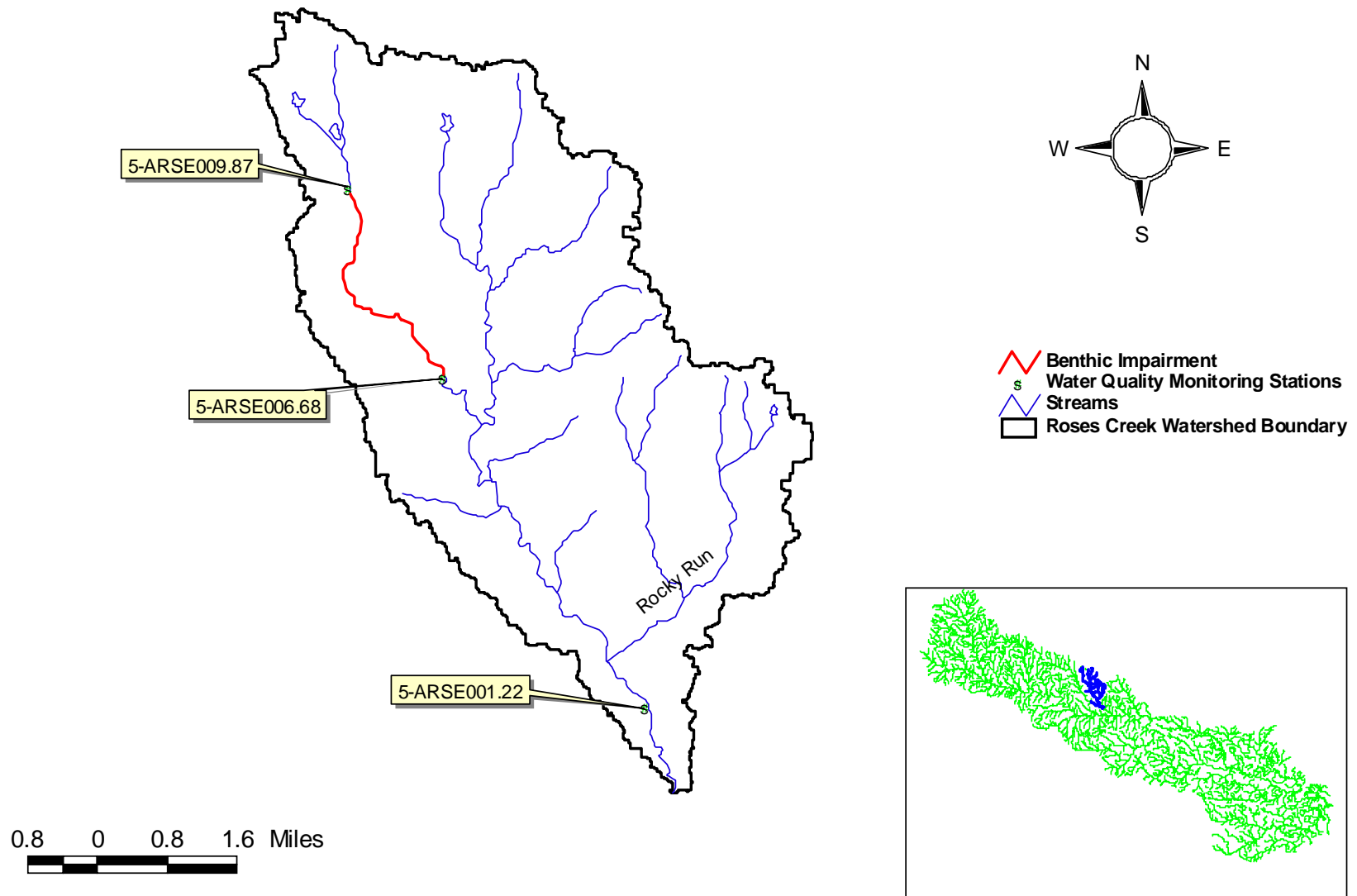
Data Used in Stressor Identification

- Environmental monitoring data
- Watershed activities that could potentially cause Benthic Impairment
 - Point Sources
 - Non-Point Sources

Environmental Monitoring Data

- **Biological Assessment Data**
 - Assessments performed at river mile 6.68 since 1990.
 - Habitat assessments also performed.
- **Water Quality Data**
 - Ambient Data Collected in the Last Year
 - Field Data Collected During Biological Assessment Surveys
- **Special Stream Monitoring Studies**
 - Diurnal Monitoring Study in August 2003.
 - Alberta STP Stream Monitoring.
 - DEQ – Alberta STP Special Studies.
- **Toxicity Testing**
 - DEQ conducted in April 2003.

Roses Creek Watershed Water Quality Stations



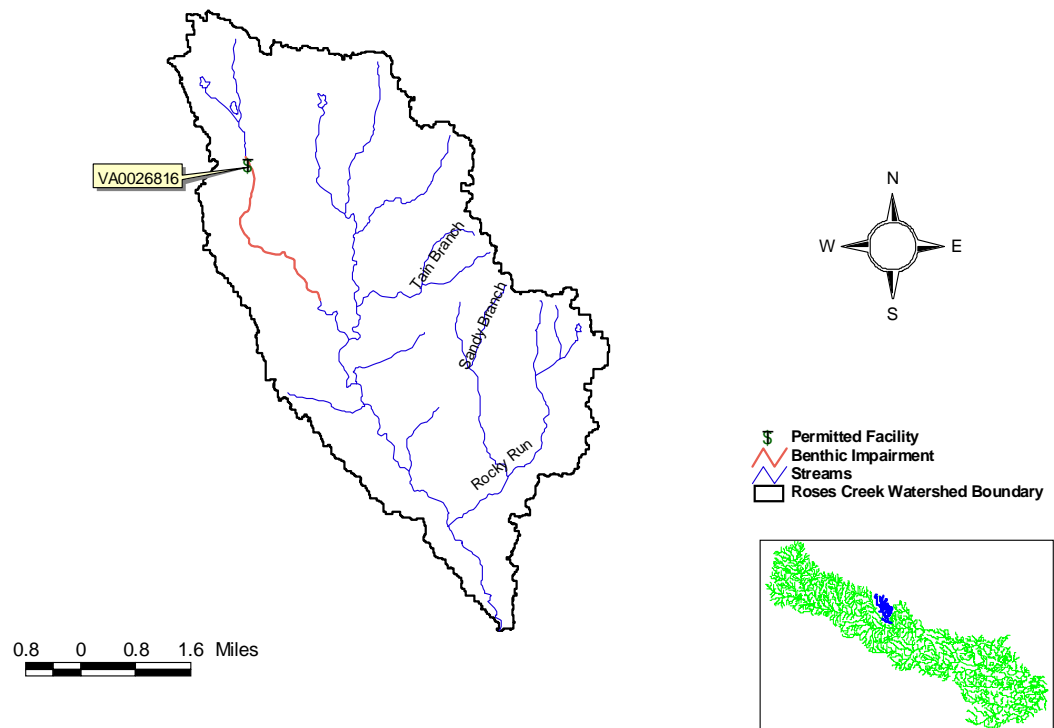
Potential Stressor Sources

- Point Sources
- Non-Point Sources
 - Agricultural Runoff
 - Forestry Operations
 - Urban Runoff

Point Source

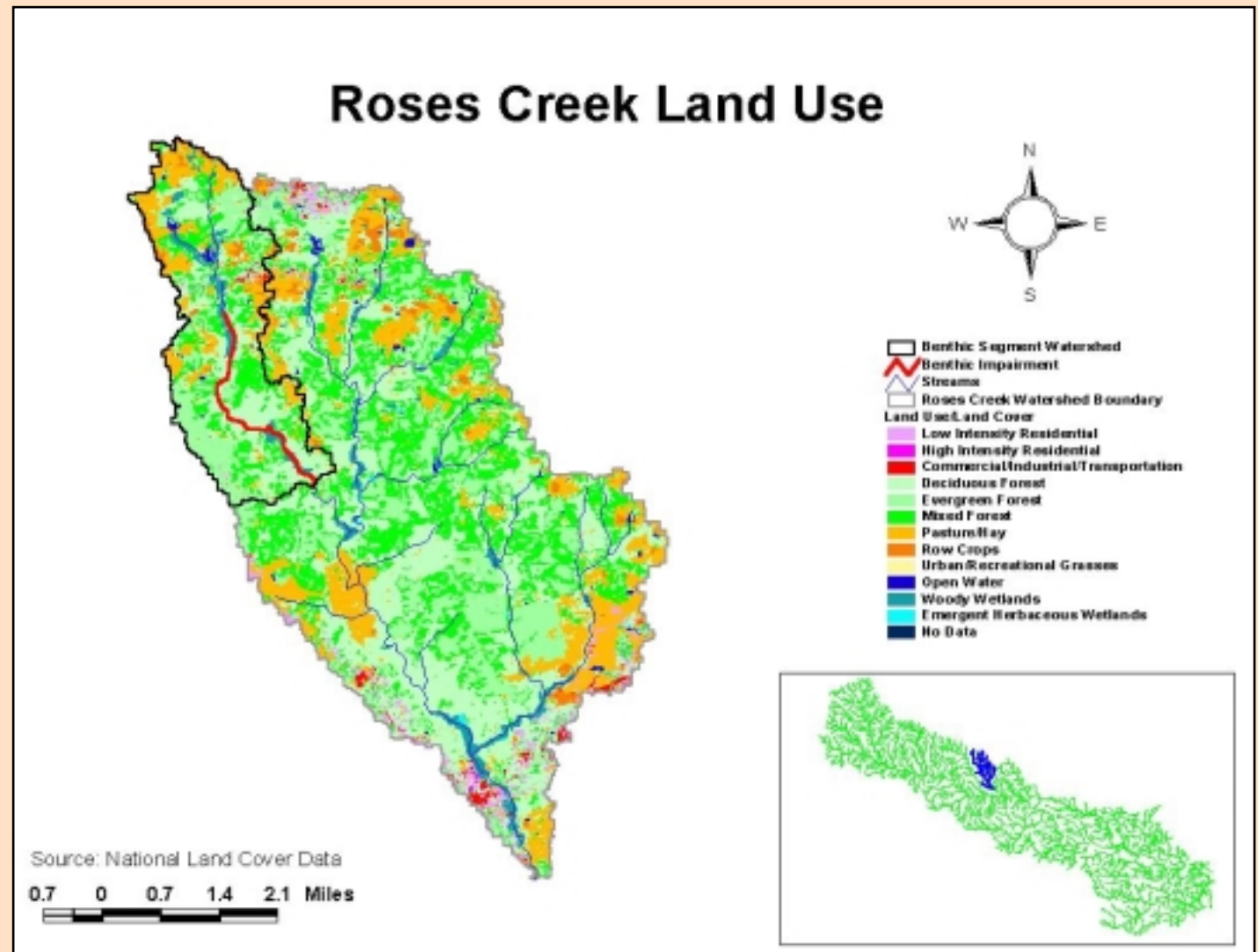
- Alberta Sewage Treatment Plant
 - (Permit VA0026816)

Roses Creek Permitted Facility



Non-Point Sources

- Land Use Activities/ Practices
 - Agricultural Runoff
 - Forestry Operations
 - Urban Runoff



Roses Creek Land Use Data (Benthic Segment)

Land Use Category	Land Use Type	Acres	Percent of Subwatershed's Land Area	Total
Water/Wetlands	Open Water	17.90	0.53	6.1
	Woody Wetlands	180.84	5.40	
	Emergent Herbaceous Wetlands	7.29	0.22	
Urban	Low Intensity Residential	22.50	0.67	1.0
	High Intensity Residential	0.00	0.00	
	Commercial/Industrial/Transportation	9.67	0.29	
Agriculture	Pasture/Hay	597.67	17.84	21.1
	Row Crop	108.10	3.23	
Forest	Deciduous Forest	1054.84	31.48	71.8
	Evergreen Forest	612.78	18.29	
	Mixed Forest	739.11	22.06	
Other	Quarries/Strip Mines/Gravel Pits	0.00	0.00	0.0
	Transitional	0.00	0.00	
	Urban/Recreational Grasses	0.33	0.01	
Total		3,351		100.0

Evaluation of Candidate Stressors

- Organic Matter
- Nutrients
- pH
- Temperature
- Sediment
- Toxics

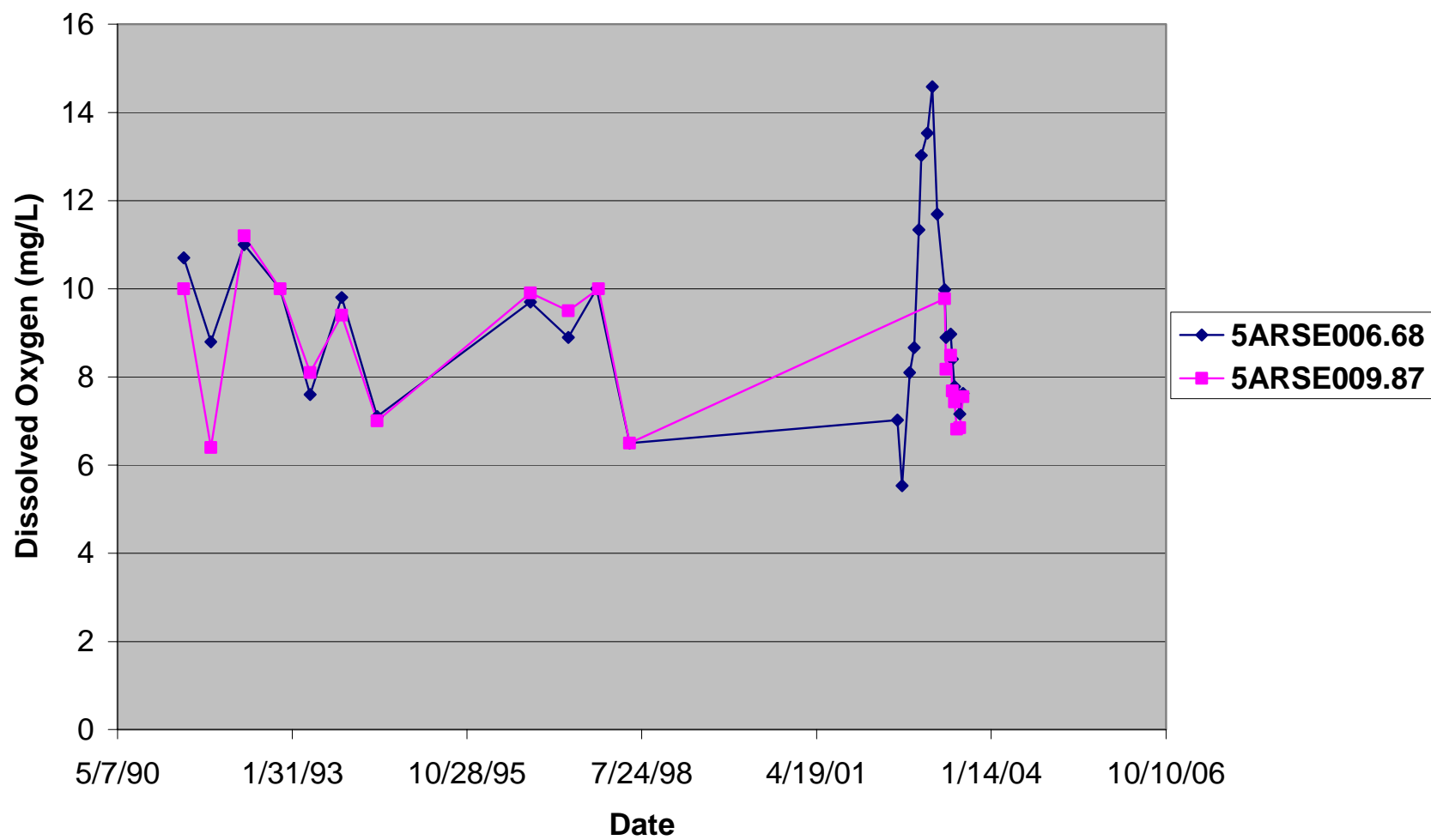
Organic Matter

- **Impact:** Excessive organic matter can lead to low dissolved oxygen which may adversely affect benthic communities.
- **Potential Sources:** Treatment Plants, Agricultural Runoff.

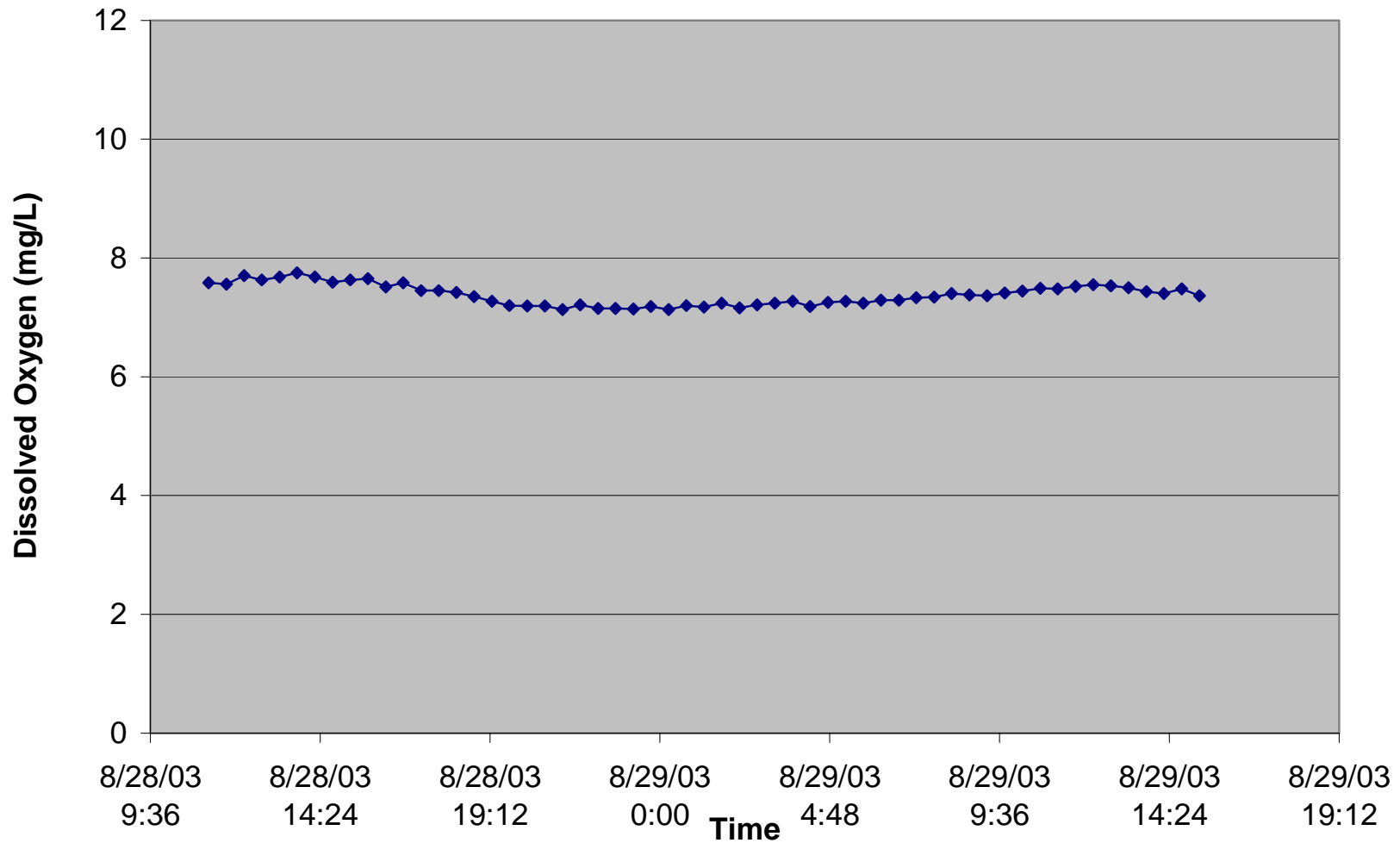
Monitoring/DMR Data Results

- **Measured dissolved oxygen values have been comparable and adequate at the reference and observed stations.**
- **Diurnal monitoring study indicates adequate levels of dissolved oxygen at station 6.68.**
- **Discharge Monitoring Report (DMR) data indicate that the Alberta STP is in compliance for BOD5.**
- **Alberta STP Stream Study indicates DO levels recover at 1700 feet downstream of the outfall.**
- **Therefore, organic matter does not appear to be impacting the creek.**

Roses Creek Monitoring Data



Diurnal Monitoring - Roses Creek - Station 6.68



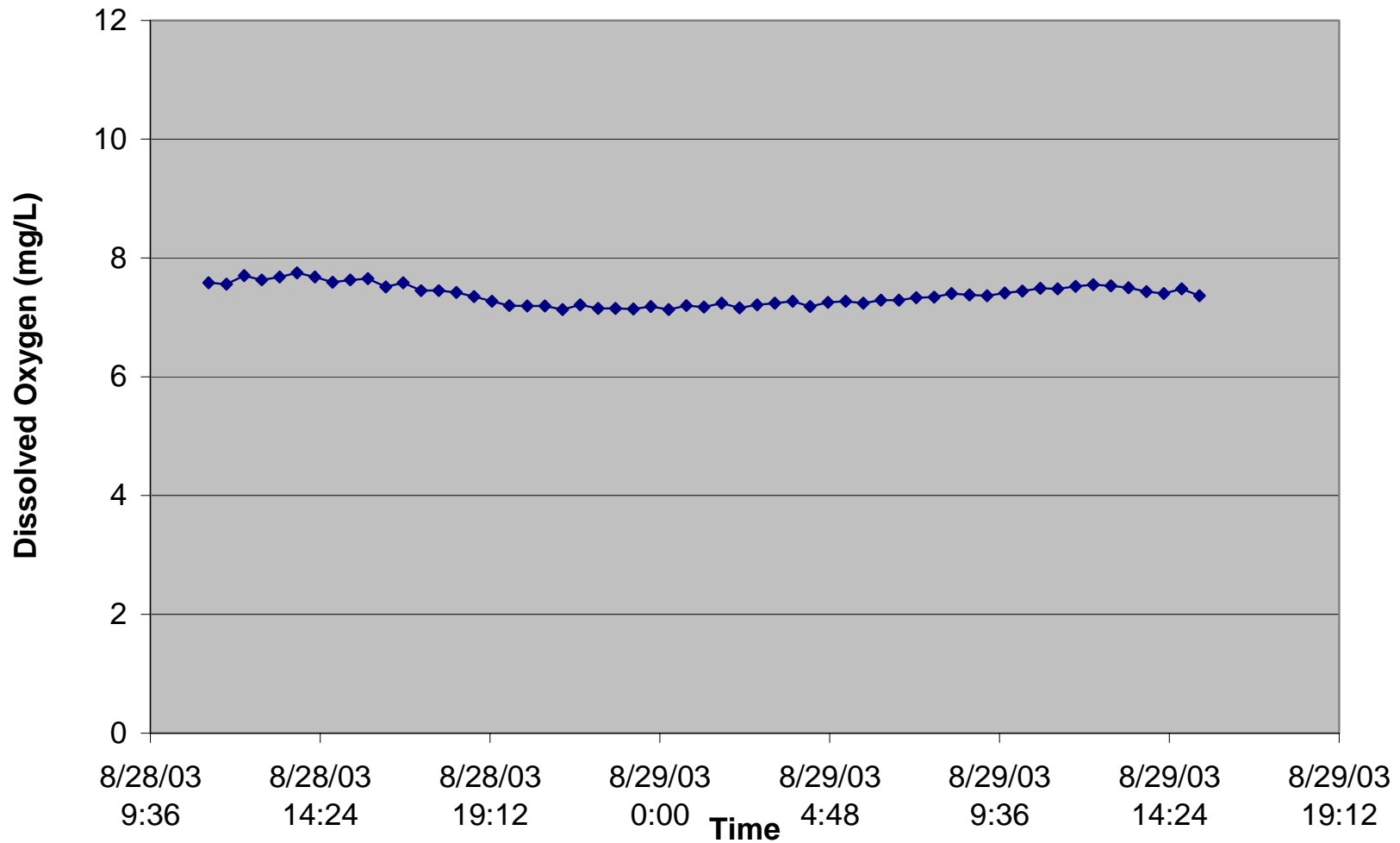
Nutrients: Nitrogen and Phosphorous

- **Impact:** Excessive nutrient inputs can lead to eutrophication (algal blooms) and low dissolved oxygen.
- **Potential Sources:** Treatment Plants, Agricultural Runoff.

Monitoring/DMR Data Results

- **Diurnal monitoring study indicates adequate dissolved oxygen throughout the entire day at station 6.68.**
- **Recent monitoring data indicates comparable values of ammonia, TKN, total phosphorus and orthophosphate at the reference and observed stations.**
- **DMR data indicate the Alberta STP is in general compliance for ammonia discharge.**
- **Therefore, nutrients do not appear to be impacting the creek.**

Diurnal Monitoring - Roses Creek - Station 6.68



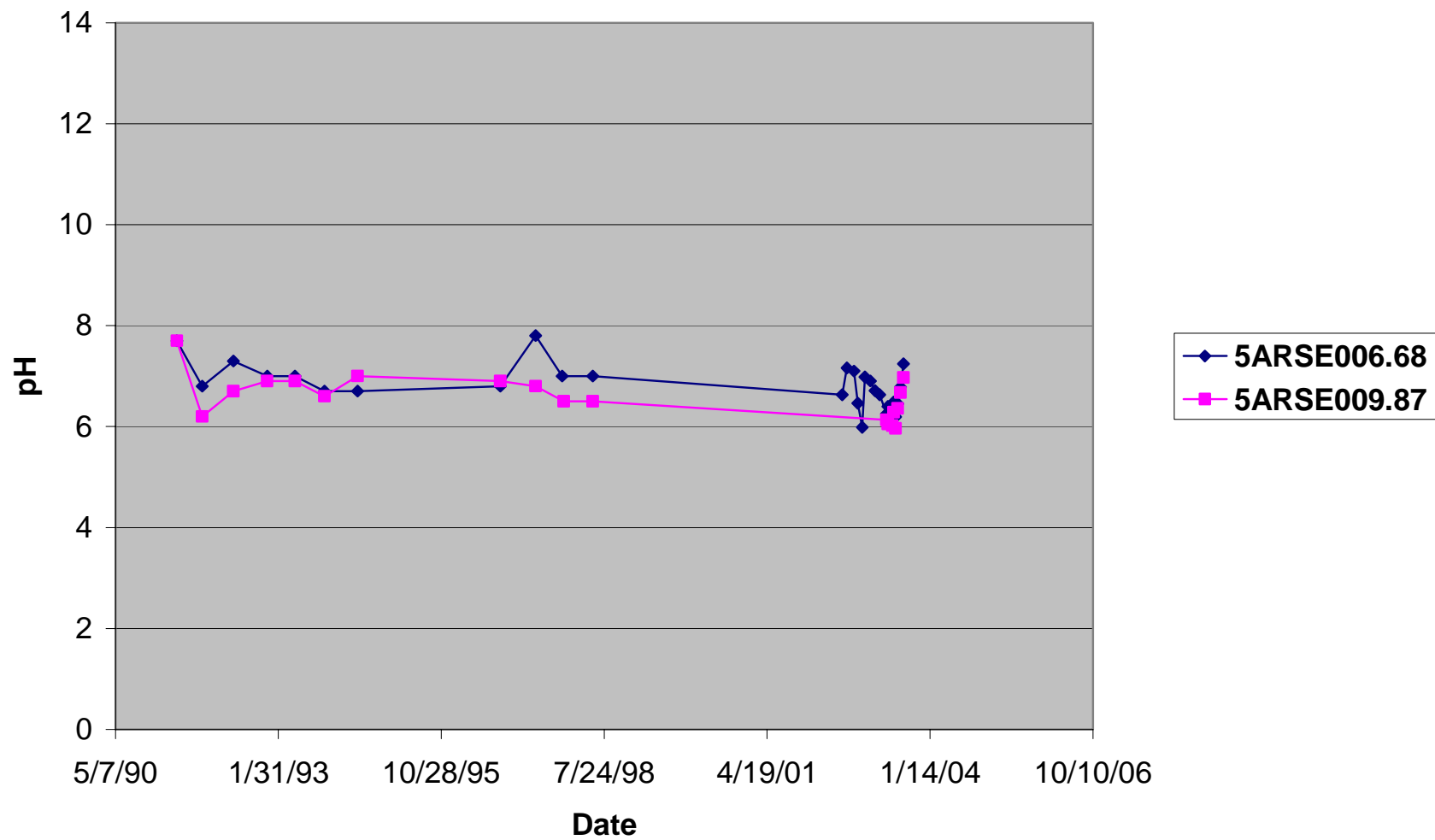
pH and Temperature

- **Impact:** Changes in pH and temperature may adversely affect the survival and growth of benthic macroinvertebrates (bugs).
- **Potential Sources:** Treatment Plants, mining, urban runoff.

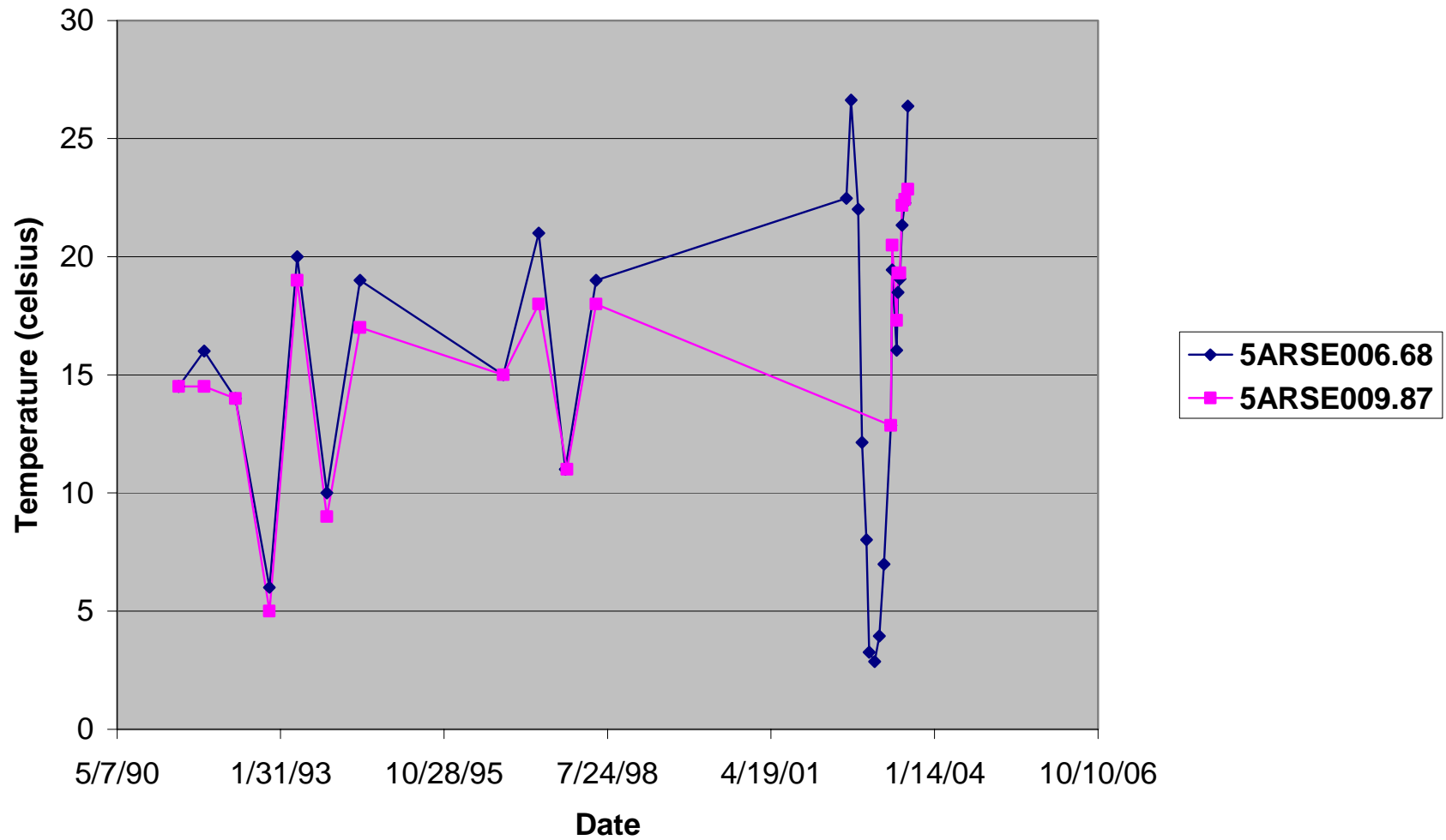
Monitoring/DMR Data Results

- **Field data indicated comparable and adequate values of pH and temperature at the reference and observed stations.**
- **Diurnal monitoring data indicate adequate pH and temperature values at station 6.68.**
- **DMR data indicate the Alberta STP is in compliance for pH.**
- **Therefore, pH and temperature do not appear to be impacting the creek.**

Roses Creek Monitoring Data



Roses Creek Monitoring Data



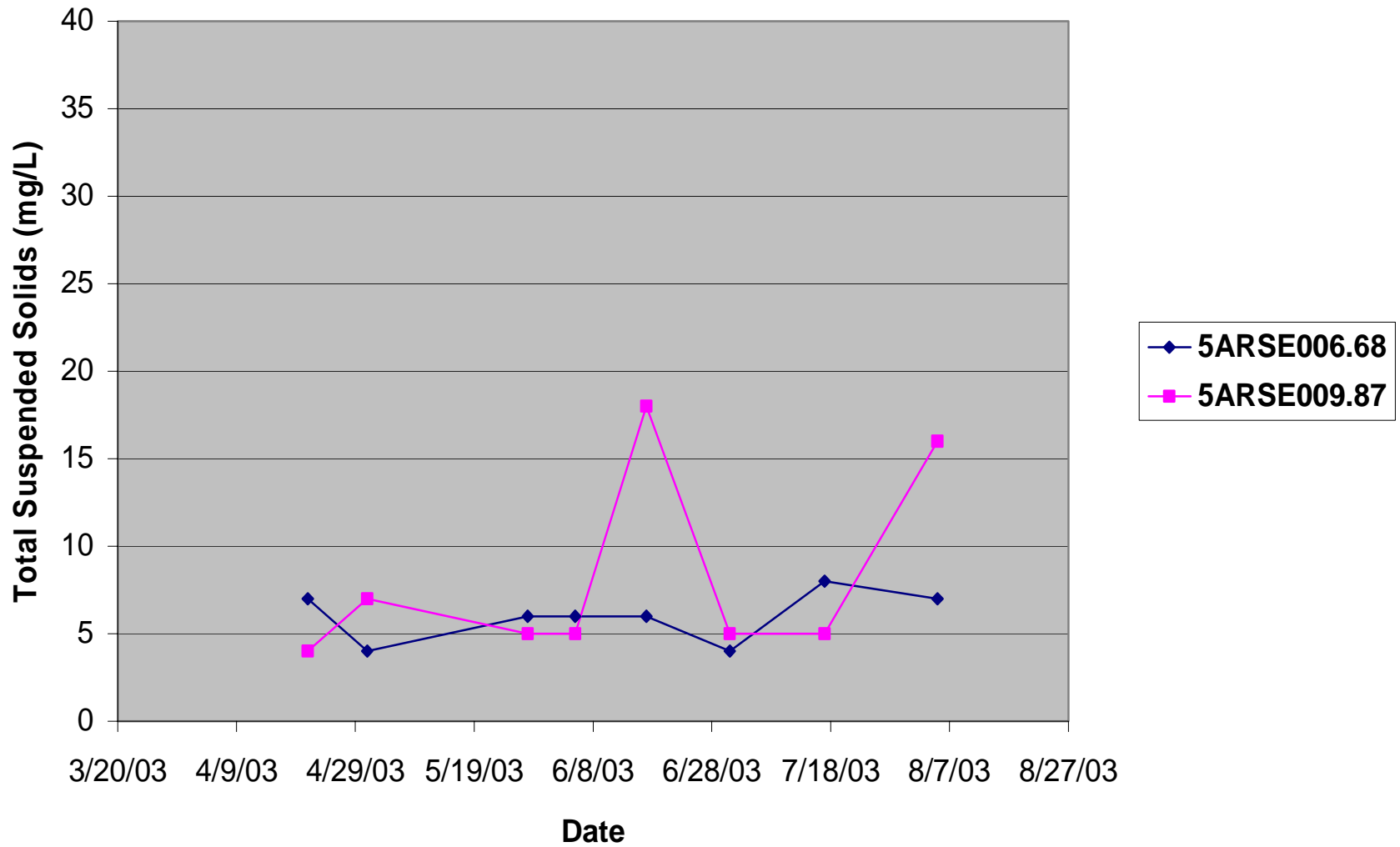
Sediment

- **Impact:** Excessive Siltation can impair benthic communities through loss of habitat (filling the pores).
- **Potential Sources:** Agricultural Runoff, Urban Runoff, Forestry Operations, Construction Sites, Mining Operations, Treatment Plants.

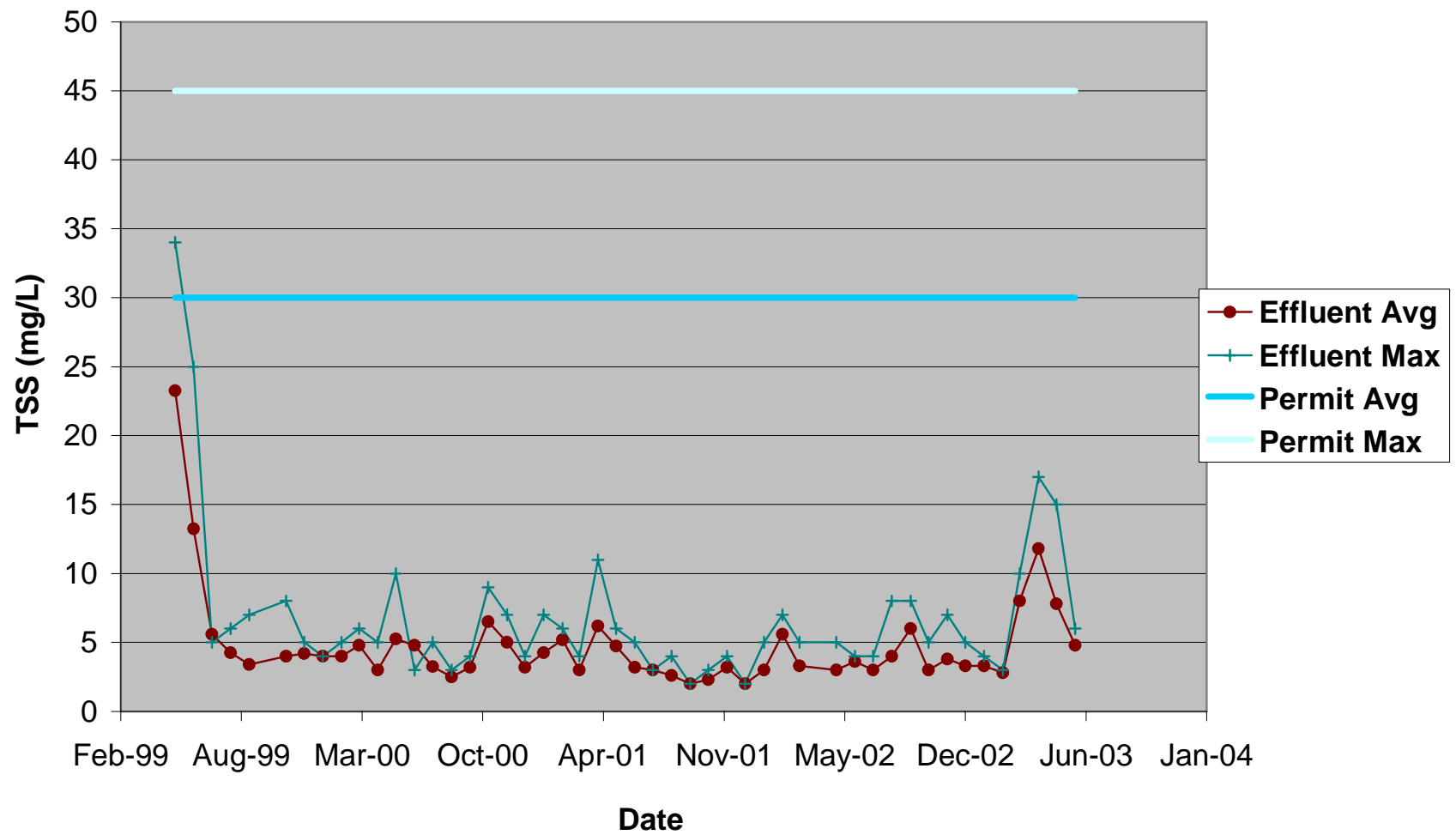
Monitoring/DMR Data Results

- **Recent monitoring data indicate comparable values of TSS at the reference and observed stations.**
- **DMR data indicate the Alberta STP is in compliance for total suspended solids discharge.**
- **Field observations this year did not indicate that sedimentation is a problem.**
- **Therefore, sediment does not appear to be impacting the creek.**

Roses Creek Monitoring Data



Alberta Wastewater Treatment Plant Effluent Data - Total Suspended Solids



Toxicity: Instream

- DEQ performed toxicity testing on Roses Creek in April 2003.
- Preliminary results indicate:
 - No mortality effects were observed.
 - A biological effect on Ceriodaphnia reproduction was observed.

Stressor Identification Summary

- **None** of the candidate stressors evaluated appear to be currently impacting Roses Creek.
- The benthic communities in Roses Creek are **not impaired** based on recent biological monitoring data:
 - Assessments in the Spring and Fall of 2002 indicated that station 6.68 is not impaired.
- What caused previous impairment ratings?

Assessment of Prior Impairments

- Bridge Construction at Route 646:
 - Sedimentation from construction activities may have impaired the benthic community.
 - The biologist noted station 6.68 recovered from construction activities by 1991.
 - State construction projects are now subject to more stringent conservation practices such as the use of silt fences.

Assessment of Prior Impairments

- Logging Operations:

- The biologist noted degradation due to specific logging activities in 1994.
- The Department of Forestry has indicated an increased observance of conservation practices by logging operations in the past decade.
- Windshield surveys of watershed indicated presence of emergent forests; clear-cutting was not obvious.

Assessment of Prior Impairments

■ Alberta STP Discharges:

- The moderate impairment rating of 1998 was directly attributed to STP overflows that discharged solids to the creek.
- The Alberta STP has undergone several upgrades since 2000 and a new operator started in 1999.
 - DMR data indicate STP effluent is in compliance with permitted limits since 1998.
 - No large overflow events have occurred since 1998.
- Roses Creek recovered from the overflow events by 2001 based on cursory survey and current assessments indicate that the Creek is not impaired.

Summary of Impairment Causes

Year	Season	Impairment Rating	Associated Cause
		5ARSE006.68	
1990	Fall	Moderate	Bridge Construction
1991	Spring	Non-Impaired	
1991	Fall	Non-Impaired	
1992	Spring	Non-Impaired	
1992	Fall	Non-Impaired	
1993	Spring	Non-Impaired	
1993	Fall	Slight	Logging Activities
1994	Spring	Slight	
1996	Spring	Non-Impaired	
1996	Fall	Non-Impaired	
1997	Spring	Non-Impaired	
1997	Fall	Non-Impaired	
1998	Spring	Non-Impaired	
1998	Fall	Moderate	Alberta STP Overflows
2002	Spring	Non-Impaired	
2002	Fall	Non-Impaired	

Conclusions

- Previous impairments appear to have resulted from transient events in the watershed.
- These events are not occurring in the watershed currently.
- The creek has recovered with time following these events and is not impaired currently.
- In the absence of similar transient events, Roses Creek should remain non-impaired.

Conclusions/Recommendations

- Roses Creek may not require a TMDL for benthic impairment and it is recommended that it be removed from the Virginia 303(d) list.

Next Steps

- Draft Report for Stressor Identification Analysis
 - Confirm results with EPA
- Present Recommendation to EPA for De-listing Roses Creek
- Prepare for the Public Meeting #2

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